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Abstract:

Based on the proposed 'PIE' analytical framework, this paper argues that the preparation, implementation and evaluation of international standards (ISOs) affect the competitiveness of (foreign-financed) export-oriented manufacturing industry in southern and south-eastern China, both in the short- and long-term. During the period of preparation, the decision to adopt ISOs is mainly driven by market demand and/or by the decisions of established competitors. Negative effects due to the diversion of scarce resources and institutional resistance to change during the period of transitional implementation are offset by the overall enhancement of the firm's productivity in the long-run. 'Tailoring for the external audit' and 'second-best' practices are two strategies commonly employed by Chinese firms to lower the transaction costs involved in ISO audits.

Keywords: international standards, ISO, competitiveness, manufacturing industry, China

1 Introduction

In the era of globalisation, major international buyers are increasingly asking their suppliers to comply with international standards to improve the competitiveness of their products. The proliferation of international standards is partly due to the World Trade Organization's (WTO) Agreement on Technical Barriers to Trade (TBT), which encourages the use of ISO 9000 and ISO 14000 (hereinafter **ISOs**) as a means of preventing unnecessary barriers to international trade (WTO, 2003). The proliferation of international standards obviously has enormous implications for the competitiveness of industries in China.

One strand of literature on this topic focused on the evaluation of the well-established international standard: the ISOs (e.g., Bryde & Slocock, 1998; Neergaard, 1999). Some, such as Ebrahimpour, Withers and Hikmet (1997), and Delmas (2002), investigated the ISO 9000 registration experience of manufacturing firms in the US. Others focused on firms based in New Zealand (e.g., Aarts & Vos, 2001) and Europe, e.g., Falk (2002), Pivka and Ursic (2002), and Sun and Cheng (2002). Although most authors reported an improvement in quality control, productivity and customer satisfaction, a number of scholars also pointed to the high transaction costs and other difficulties of ISOs implementation (see the next section) (Quazi & Padibjo, 1998; Ebrahimpour, Withers & Hikmet, 1997; Sun & Cheng, 2002; Thomas & Webb, 2003). All of these studies help us to gain an understanding of the experience of developed countries in implementing ISOs. But what of China?

A significant proportion of the literature on China published during the past few years has focused on issues related to the country's accession to the WTO, e.g., Harwitt (2001), Woo (2001), Adhikari and Yang (2002), Yeung (2002), Panitchpakdi and Clifford (2002), Lardy (2002), etc. No studies have been conducted on the effects of compliance with international standards on the competitiveness of Chinese industry, with the probable exceptions of those by Chin and Pun (1999) and Yeung and Mok (2002). Chin and Pun (1999) investigated the factors affecting the implementation of ISO 14000 in printed

circuit board manufacturing in Hong Kong. Yeung and Mok (2002:173-175) argued that compliance with international standards is one of the four managerial challenges for manufacturing sectors in China. Despite the significance of these works, they are unable to give a satisfactory answer to the following question: What are the impacts of implementing ISOs on the competitiveness of Chinese manufacturing sectors?

To fill this gap in the literature, this paper investigates the impacts of implementing ISOs on the competitiveness of manufacturing firms in China. As the largest manufacturer in the world of 80 products in ten manufacturing sectors, such as toys, televisions, textiles and clothing, footwear, iron and steel, and the fourth-largest exporter in the world, a number of analysts have dubbed China the 'workshop of the world'. Obviously, the proliferation of international standards (especially the ISOs) has enormous implications for the competitiveness of manufacturing sectors in China. The adoption of ISOs can be generally divided into three inter-related processes – preparation, implementation and evaluation (see the next section) – and we develop one hypothesis on the impact of each ISOs adoption process on the competitiveness of manufacturing firms in China. Due to space constraints, it must be emphasised that international standards other than ISOs are not the focus of this paper and will be not be discussed in detail here.

The research hypotheses and methodology of this paper will be presented in the next section, before describing the nature of ISOs. The three hypotheses on the competitiveness of Chinese manufacturing industry will be tested from the perspectives of preparation, implementation and evaluation in sections 4-6. Finally, the major findings of this paper and its theoretical and policy implications will then be presented.

2 Research Hypotheses and Methodology

2.1 Research Hypotheses

The International Organization for Standardization (ISO) argues that improvements in cost efficiency and productivity (through less wastage of raw materials and better quality control of products) is the driving force behind the

adoption of ISOs (ISO, 2003a) (see the next section). This is supported by the finding of Santos and Escanciano (2002), who argued that improvements in the quality of an organisation's products and services is the main reason for Spanish firms to adopt the ISO 9000. Contradicting the ISO's proposition, Yeung and Mok (2002:173) suggested that fulfilling customer requirements is one of the reasons why manufacturing firms in China adopt the ISOs. This argument is consistent with the findings of Brecka (1994), Chin and Pun (1999), Sun and Cheng (2002), and Terziovski, Power and Sohal (2003) in other developed countries. Therefore, we would expect that:

Hypothesis 1: Manufacturing firms in China adopt the ISOs to fulfil market requirements and maintain their international competitiveness.

ISO demands that certified firms keep detailed documentation on their manufacturing processes. Under a systematic division of labour and documentation procedures, a certified firm should improve its efficiency of production by reducing wastage of raw materials and improving quality control on products (ISO, 2003a). Based on a sample of certified firms in Spain, Santos and Escanciano (2002) argued that the most significant benefit of ISO 9000 certification is a better understanding of an organisation's processes and responsibilities. Despite these positive findings, Quazi and Padibjo (1998) pointed to the unexpectedly high costs of implementation, and the large amount of documentation required by the ISOs. Ofori, Gang and Briffett (2003:1402-1403) revealed that there has been no cost savings in the Singaporean construction industry from implementing ISO 9000. In their studies of Slovenian companies, Pivka and Ursic (2002) also pointed out the high cost of implementing ISOs during the transitional period. Juran (1999:30; italics added) even stated that: 'for companies with good quality systems, the standard often just add *costs*, *delays* and *burdensome documentation*, rather than providing any competitive advantage....' We would therefore expect that:

Hypothesis 2: Manufacturing firms in China find the implementation of ISOs costly, at least during the transitional period.

On the effects of ISOs adoption, most authors reported that ISO-certified firms saw an improvement in quality control, productivity and

customer satisfaction, e.g., Adanur and Allen (1995), Calingo *et al*. (1995), Lee, Leung and Chan (1997), Quazi and Padibjo (1998), Chin and Pun (1999), etc. Nonetheless, Ebrahimpour, Withers and Hikmet (1997) suggested that some firms have experience difficulties in conducting internal quality audits and, subsequently, in taking the required corrective actions. Sun and Cheng (2002) and Thomas and Webb (2003) have even questioned the cost-effectiveness and feasibility of implementing ISO 9000 in small-to-medium enterprises (SMEs) in the European manufacturing sector. As some firms in developed countries have difficulties in fully complying with ISOs' principles, it is plausible to expect that:

Hypothesis 3: Manufacturing firms in China are finding ways to fulfil the audit procedures without fully complying with the ISOs' 'continual improvement' principle.

2.2 Methodology

From the above, it is clear that most existing studies have analysed some aspects of the adoption of ISOs, such as the effects of implementation, but have not comprehensively examined its dynamic impact (including the preparation, implementation and evaluation of ISOs) on the competitiveness of firms. To name a few examples, Hutchins (1993) provided guidance on ISO 9000 registration and audits, Brecka (1994), Neergaard (1999), and Najmi and Kehoe (2000) investigated the effectiveness of ISO 9000 on business performance, and Fiorentino and Perigord (1994), and Williamson, Rogerson and Vella (1996) studied the role of auditors in ISOs certification. In their cross-sectional study conducted in Australia, Terziovski, Power and Sohal (2003) covered parts of the preparation and evaluation processes in the adoption of ISOs, while Ofori, Gang and Briffett (2002) investigated the preparation and implementation processes in the adoption of ISO 14000 in the construction industry in Singapore.

As there is no theory exists to allow us to test the above three propositions satisfactorily, this paper proposes the **'PIE'** analytical framework to investigate the impact of adopting ISOs on the competitiveness of manufacturing firms in China. The 'PIE' analytical framework provides a

systematic approach to disentangling the effects of ISOs adoption at the firm level, dividing the move into three distinct processes (Figure 1):

- ***P*reparation** ('P'): Preparing for and deciding on ISOs, e.g., what are the reasons for implementing ISOs?
- ***I*mplementation** ('I'): Implementing ISOs and their processes, including documentation, training, etc.
- ***E*valuation** ('E'): Evaluating (continuous) compliance with ISOs, including third-party audits.

[INSERT FIGURE 1 ABOUT HERE]

In reality, these three processes, 'P', 'I' and 'E', are inter-related, e.g., the level of preparation partly determines the success of the implementation at the firm level, and the audit will result in remedial actions and so forth taken by the firm (Figure 1).

To examine the impact of implementing ISOs on the competitiveness of firms, in August 2001 and March-June 2003, the authors conducted semi-structured interviews with 30 presidents and managers (including production managers or engineers responsible for the implementation of ISOs) of 22 manufacturing firms located in Guangdong and Zhejiang provinces.[1] In 2001 and 2003, the principal author also interviewed an experienced ISO consultant in the Hong Kong Special Administrative Region, both before and after the field surveys were conducted in mainland China. The information provided by this ISO consultant was used by the authors to develop a list of interview questions addressing the three research hypotheses. The interviews and firm visits were conducted with the assistance of various institutes in China, in particular the Management Commission of the Hangzhou Economic and Technology Development Zone in Zhejiang, the Bureau for Foreign Economic Relations and Trade, and the Guangdong Provincial Research Centre for Economic Development in Guangdong. It is well-understood that securing the appropriate personal connections is probably the most important precondition

[1] The 30 interviewed manufacturers and their positions are as follows: two Presidents, two Vice-presidents, 11 General Managers, seven Deputy General Managers, two Financial Managers, and six Factory/Production Managers.

for conducting visits to firms in China. This explains why all of the firms that were investigated are located in either Zhejiang (17 cases) or Guangdong (5 cases). Unsurprisingly, most of the firms located in Guangdong are financed by Hong Kong-based entrepreneurs, while most of the firms that were visited in Zhejiang are financed by Taiwanese or Japanese (partly due to geographical proximity and historical ties). Each interview and firm visit lasted for at least an hour and the questions focused on empirical evidence related to the three research hypotheses on the preparation, implementation and evaluation of ISOs and their impact on competitiveness. The field survey co-ordinators (including several officials from local governments) accompanied the researchers during the interviews and firm visits, but they never intervened in the interviews. Two (in-house) interpreters assisted in the interviews with three senior Japanese managers in two Japanese-financed firms in Hangzhou. It is of paramount importance that the interviewed individuals and firms remain anonymous. Therefore, in the paper the empirical information from the interviews is flagged as a field survey.

The sample firms ranged across a variety of investment formats: wholly foreign-owned ventures (ten cases), equity joint ventures (ten cases), and locally-funded firms (two cases). They also ranged across several manufacturing sectors: textiles and clothing (seven cases), food and beverages (three cases), power and cooling equipment (three cases), telecommunications (two cases), paper packaging materials (two cases), household appliances (two cases), and medical equipment, electronic, and automobile components. With the exception of two smaller-size firms (the locally-funded automobile components manufacturing firm and another locally-funded clothing firm in Zhejiang), all of the other sample firms are large-scale ones with registered capital of at least several million US dollars and employing several hundreds to thousands of workers. There are major subsidiaries of five transnational corporations (TNCs) in the sample, including Motorola, Siemens and Matsushita. The samples of textile and clothing firms include mainly the subsidiaries of TNCs, major sub-contractors for designer brand clothing or major department stores in the US and Europe, e.g., Kellwood (US), May Department Store, and J.C. Penny. Thirteen out of 22 had already been

awarded the ISO 9001 (five of them also have 14001 certification), while another five have concrete plans to obtain this certification within a year. As to how long the sample firms had acquired the ISOs certification, the time ranged between one and seven years, e.g., from newly certified firms to firms with well-integrated systems. The size of the sample is relatively small, but it is representative of manufacturing firms in southern and south-eastern China, especially (export-oriented) foreign-financed ones. Moreover, the findings should be of general interest to researchers and managers in developing countries, especially those who are considering adopting ISOs.

3 What are ISOs?

Traditionally, standards normally refer to product standards. They are codified and agreed regulations, guidelines or characteristics of activities, established by consensus and approved by a recognised body, for common and repeated use and to assess performance. Partly due to an increasingly globalised economy, standards of quality assurance, environmental impact, labour conditions (including health and safety) associated with production processes have been developed by various organisations. For instance, the British Standards Institution (BSI) has recorded more than 500,000 different standards globally (of which 20,000 are the current British Standards, BS) (BSI, 2003a:2-5). Standards can be applied to individual companies and their supply chains; they can be generic or industry sector-specific; and they can be regional or global (Table 1).

[INSERT TABLE 1 ABOUT HERE]

ISO 9000 is mainly concerned with the **'Quality Management System' (QMS)**, i.e., whether a firm has done everything to ensure that its products conform to the customer's requirements.[2] In its original version, the ISO 9000 series contains five documents: ISO 9000 to ISO 9004. ISO 9001/2/3 concern quality assurance, while ISO 9000/4 consists of guidelines

[2] The first management systems standard (BS 5750) and the first environment management standard (BS 7750) in the world were published by BSI in 1979 and 1992, respectively, before

for selecting an appropriate standard and its use. 'ISO 9000 certification' means certification against ISO 9001/2/3 (ISO, 2003a). In 2000, the International Organization for Standardization (ISO) revised the standard and replaced the three 1994 versions (i.e., ISO 9001/2/3:1994) with ISO 9001:2000; i.e., ISO 9001:2000 is the only certification standard in the ISO 9000 series that can be registered by a third-party accredited auditor. Organisations certified to ISO 9001/2/3:1994 had to comply with ISO 9001:2000 by 15 December 2003 to remain certified (BSI, 2003b:3; ISO, 2003d:4).

Generally, the typical benefits of implementing ISO 9000 for an organisation include (BSI, 2003b:4; ISO, 2003a):

- Greater cost efficiency and reduced liabilities, e.g., less wastage, elimination of procedural problems
- Improved product design and quality: products and services consistently meet customer requirements
- Customer satisfaction and improved public image
- Maintenance of or increase in market share
- Improved communications and morale in the organisation
- Increased confidence in the production system
- Less time required to train new employees

The popularity of ISO 9000 can be illustrated by the huge increase in the number of certificates issued to organisations worldwide (Table 2). In 1995, 127,000 organisations had been certified as ISO 9000 compliant. By the end of 2001, 510,000 organisations in 161 countries had been registered for ISO 9000 (ISO 9001/2/3:1994), of which 44,000 (8.7%) were certified for the ISO 9001:2000 (ISO, 2003d:4). Regionally, Europe accounted for the lion's share of the certificates issued in the 1990s. The UK alone accounted for more than 40% in 1995, which is natural given the important role of BSI in the development of ISOs. As the major base of export-oriented processing and assembling firms, the number of organisations certified for ISO 9000

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being adopted by the ISO as the ISO 9000 in 1987 and ISO 14000 in 1996 (BSI, 2003b:2, 2003c:2).

compliance in the Far East increased almost 14 times to 126,000 in 2001 (accounting for 25% of all ISO 9001/2/3:1994 certifications and 33% of all ISO 9001:2000 registrations globally). Certified organisations in China grew at an even more breath-taking rate, rising from a mere 507 in 1995 to more than 57,000 in 2001 (more than 7,000 of them were ISO 9001:2000 compliance), a 110-fold increase in six years. The popularity of ISO 9000 can partially be explained by the fact that market-driven Asian exporters are registering for ISOs to meet the demands of international buyers.

[INSERT TABLE 2 ABOUT HERE]

ISO 14000 is primarily about the **'Environmental Management System' (EMS)**, i.e., whether the firm has done everything to ensure that a product will have the least harmful impact on the environment during production or disposal. 'ISO 14000 certification' means certification against ISO 14001 (ISO 14004 provides additional guidance and explanations on ISO 14001) (ISO, 2003a). ISO 14000 was developed with the aim of providing a generic framework for an overall, strategic approach to an organisation's environmental policy, plans and actions.

The major benefits for an organisation of implementing ISO 14000 for include (ISO, 2003a):

- Reduced cost of waste management through reduced waste generation and disposal costs
- Savings in the consumption of energy and raw materials
- Improved process efficiency
- Utilisation of recoverable resources
- Lower distribution costs
- Improved corporate image among regulators, customers and the public

As a relatively new standard, and one demanding a higher level of investment, ISO 14000 did not gain in popularity outside Europe until the late 1990s (Table 3). In fact, relatively few American companies have adopted this standard since they fear public scrutiny of their environmental performance (Delmas, 2002). As with ISO 9000, Europe accounts for about half of the

certificates issued. At the end of 2001, more than 36,000 organisations in 112 countries were certified for ISO 14001 (ISO, 2003d:5). The adoption of ISO 14000 has been relatively rapid in the Far East, where about one-third of all certified organisations are located. However, this is not the case in China, where a little over 1,000 organisations were registered as ISO 14001 compliant in 2001 (accounting for less than 3% of the world's total).

[INSERT TABLE 3 ABOUT HERE]

Three characteristics of ISOs need to be clarified. First, ISOs are generic management system standards that developed under the guidance of the ISO. ISO 9000 lays down what requirements of the quality system a firm must meet, but it does not prescribe how they should be achieved. ISO 14000 requests that a firm commit to complying with the applicable environmental legislation, and to continuous improvement based on the EMS framework, but it does not lay down specific environmental benchmarks for the firm. This not only leaves greater scope and flexibility for the system to be implemented in different business sectors, and in different business and national cultures, but also allows it to be implemented by a wide variety of organisations, whatever their current level of quality management and environmental maturity. Second, ISOs are concerned with the way an organisation goes about its work (the processes), and not directly with the result of this work (the products). Although they are normally (though wrongly) regarded as a benchmark for quality and environmental friendliness, they are **not** product or performance standards: ISO 9000 is not a standard for product quality and ISO 14000 is not a standard for environmentally friendly products. Third, the ISO publishes the guidelines for the standard, but it does not conduct assessments *per se*: conformity assessments are conducted and the ISO 9001:2000 or ISO 14001 certificates are issued through 750 accredited independent auditors worldwide. **The competency of these certification agencies is regulated by their corresponding (national) accreditation bodies (not by the ISO)** (ISO, 2003a, 2003c:5-9).

4 Preparation of ISOs: To be or Not to be?

Before implementing ISOs, the firm has to decide whether it is cost-effective to do so. The testing of the hypothesis on the preparation for ISOs can be conducted from two perspectives: market-driven and producer-driven adoption.

4.1 Market-driven adoption: We do not have much choice!

For TNCs subsidiaries, where the costs of ISOs implementation are not a major concern, their adoption can be part of a corporation-wide marketing strategy to protect the company's reputation and the recognition of brand names. Although several managers have expressed doubts about the actual impact of ISOs on productivity at the firm level (especially because of the tedious paperwork involved), all senior managers of the TNCs subsidiaries emphasised this point during the interviews (see the next section) (Field survey, August 2001, March-June 2003).

Unlike pro-active managers who adopt ISOs because of the perceived cost advantages of doing so, in reality, some manufacturers decided to adopt the standards to meet the market demand. This phenomenon is normally observed in specific industrial sectors. For instance, international standards are the industrial norms in the information technology sector, where products have to conform to various radio and radiation emissions requirements outlined by the regulatory authorities, e.g., part 15 of the FCC's rules on interference, the MPR 1990:10 emission rule, etc. This is also the case in China, where only certified manufacturers are allowed to participate in public tenders in government procurements. The adoption of ISOs is increasingly common, especially among buyers in developed countries, but it is still not the norm in some labour-intensive sectors, e.g., textiles and clothing. The bottom line for manufacturers is best summarised by the opinion of a Deputy General Manager in a Taiwanese-financed electronic components manufacturing firm: 'We had to adopt the ISO 9000 standard as this is a condition for securing overseas orders in the telecommunications sector. Potential overseas customers will not even consider our firm if we do not have the ISO 9000

certification. Whether we would have wanted to adopt it was not an issue!' (Field survey, March 2003). This is also clearly demonstrated by the experience of a Taiwanese-financed equipment manufacturing firm in Guangzhou, where a major buyer in the US identified the lack of an ISO 9000 certification as one of the reasons for not placing a US$20 million order with the firm in 2002 (*Ibid*.). The market-driven factor is also the determinant in the adoption of ISOs in Hong Kong (Chin & Pun, 1999), Australia (Terziovski, Power & Sohal, 2003) and Norway (Sun & Cheng, 2002).

ISO 14000 is less commonly adopted, as it is not yet a condition for entering overseas markets in a number of industries. It is more costly for firms to implement ISO 14000 as doing so demands heavy investment in environmentally friendly equipment to ensure that the emission of pollutants is kept to a minimum. For some SMEs, the investment required is prohibitively high. For marketing purposes, some firms are adopting parts of the EMS guidelines under ISO 14000, e.g., to implement the CFC-free (ozone friendly) and European green standards demanded by their major international customers (Field survey, August 2001, March-June 2003). This 'selective-adoption' approach is best summarised by the General Manager of a French-financed centralised air conditioning equipment firm in Hangzhou: 'As long as we can keep our customers without the ISOs, we won't do it. As a businessman, I will only do what the market demands' (Field survey, April 2003). This is basically compatible with the strong reservations on ISO 14000 among Singaporean building contractors reported by Ofori, Gang and Briffett (2002:1405-1406).

4.2 Producer-driven adoption: Do we actually need it?

The adoption of ISOs is not customer-driven in all cases. It can also be producer-driven. Some manufacturers have decided to adopt the ISOs because of 'strategic considerations' and 'brand name effects'. In other words, some manufacturers have decided to follow in the footsteps of their established competitors who have adopted the ISOs, although they may not expect any short-term competitive advantages from doing so. Their rationale is simple: established manufacturers would not invest (heavily) in a new system if they

do not expect to gain significant (long-term) cost advantages by doing so (Field survey, March-April 2003). This 'herd instinct' among manufacturers is an indication of the competitiveness of the market in China.

Some opportunistic firms include the ISO 9001 or ISO 14001 certification marks in advertisements of their products. They do this even though the ISO has explicitly stated that advertisements should not use the certification as a guarantee of the quality of the product (ISO, 2003d:3-9). The motivation of these firms is well summarised in the opinion of the General Manager of a Taiwanese-financed printing firm in Guangzhou: 'ISO is a brand name *per se*. Although some firms may not need ISOs, they are still investing in them as the relatively low costs of certification can easily be internalised in China' (Field survey, March 2003). The cost of certification of ISOs is normally between 30,000 and 40,000 *yuan* in China (when certified through Chinese-based accredited auditors), which is one-fourth (or even less) of the cost of adoption elsewhere (Field survey, August 2001, March-April 2003).

The above discussions support the hypothesis on the preparation for ISOs. Manufacturing firms in China adopt ISOs to fulfil the demands of their customers and maintain the competitiveness of their products in the international market. Rather than aiming for the perceived costs advantages outlined by the ISO, some firms adopt the ISOs largely to follow the strategy of their established competitors.

5 Implementation of ISOs: Do what you say?

The implementation of standards requires that the workforce adapt their working styles to the four principles underlying ISOs (FitzGibbon, 1996):

- *Say what you do*: document each step in the company's business process.
- *Do what you say*: ensure that all processes adhere to the written procedures.
- *Show what you have done*: document evidence that the QMS and/or EMS meet ISO requirements and that the quality and environmental standards are being implemented effectively.

- *Verify*: conduct periodic internal audits to ensure the continued suitability, compliance and effectiveness of the QMS and/or EMS.

The overwhelming majority of firms interviewed experienced two major areas of difficulty in implementing ISOs during the transitional period – documentation and resistance to change – and this in turn affected their competitiveness.

5.1 Documentation and Training

Documentation is vital for the preparation and implementation of ISOs. The aim is to identify the 'best practices' (business procedures) and provide systematic guidance for managerial and production staff. Before the implementation of ISOs, a company's workforce has to undergo in-house training, including overview and awareness training, assessors training and pre-audit training, provided by the consultants. This can be costly in the short-term, but the adoption of ISOs will bring long-term benefits for firms, at least in theory. Among the 13 case studies, the effects of ISOs implementation on productivity ranged from negligible (for a Hong Kong-financed and a Taiwanese-financed paper packing materials manufacturing firms) to a massive but untypical 30% improvement (for a Taiwanese-financed electronic components manufacturing firm). Generally, the firms that experienced an improvement in productivity are those that had implemented the ISOs for more than a year, allowing time for the system to become fully institutionalised (Field survey, August 2001, March-June 2003). This is similar to the experience in developed countries (Brecka, 1994; Najmi & Kehoe, 2000; Pivka & Ursic, 2002).

Two major documentation-related difficulties are encountered by certain firms when implementing ISOs: the level of detail required in the documentation, and the division of labour.

Rather than tailoring their writing to the employees' level of ability, consultants tend to either simplify the system documents by over-generalising as they are aware of the workforce's resistance to change (see below) or over-complicate the system documents and scare the workforce by producing

volumes of heavy-duty documents (by including every conceivable scenario and with elaborate definitions of benchmarks) (FitzGibbon, 1996). In a Taiwanese-financed electronic components firm in Guangzhou, the employees used 250,000 sheets of paper to document all of the details in the administrative and manufacturing processes during the first year in which ISO 9001 was implemented in the firm. The firm's productivity suffered as employees spent weeks preparing and then archiving tons of paper. In another Hong Kong-financed paper packing materials manufacturing firm, the owner estimated that approximately one-third of the working hours of his workforce is spend on ISOs documentation. Obviously, the high transaction costs in dealing with the paperwork lower the firm's competitiveness. This is a common problem during the first year of ISOs implementation, when employees are not familiar with the new system. The transitional period varies from firm to firm, but normally lasts one to two years for well-prepared firms and even longer (e.g., three to four years) for firms that have prepared adequately prior to adoption (Field survey, March-June 2003). Obviously, both over-simplified and over-complicated documentation are equally ineffective in facilitating the implementation of ISOs. The former leads to an under-prepared workforce (hence, unnecessarily disrupting production and making it difficult for a company to fully reap the benefits of QMS) while the latter leads to an over-prepared workforce (hence, driving up costs, lowering competitiveness and unnecessarily delaying the progress of implementation). This finding is compatible with the experience of firms in other developed countries (Juran, 1999:30; Thomas & Webb, 2003; Yeung, Lee & Chan, 2003).

The division of labour (who does what and when under the new system) is another important area that relates to the appropriateness of the documentation and the training that should be provided for the workforce. Crucial questions about co-ordination between different departments include: Has the documentation been divided by department or function into easily useable manuals? Has it clarified the roles and responsibilities of different staff? The level of detail on the division of labour is essential in the adoption of a QMS. For instance, name tagging can be an effective way of controlling the quality of products as it allows the time of production the person

responsible for a batch of rejected products to be pinpointed quickly. However, name tagging conflicts with the traditional approach in China of collective responsibility – where the whole team is responsible for the output – and rejected goods represent a loss of face for the individuals concerned. When they encounter such institutional inertia, managers will have to prepare the workforce for the implementation of ISOs.

5.2 Documentation and Institutional Inertia

Institutional inertia – the reluctance of the workforce to adopt changes in administrative procedures and production processes – is probably one of the greatest challenges for senior management in implementing ISOs.

From the perspective of administration, the adoption of ISOs may lead to duplicated documentation during the transitional period. This is especially the case in firms with established but incompatible procedures of documentation. As it takes time for all administrative staff to become familiar with the new system, it is common for the firm to concurrently implement both in-house and ISOs documentation procedures to minimise the risk of disruption, e.g., unnecessary delays in the processing of vital products and market information and even their loss. In such circumstances, some administrative staff would naturally be reluctant to accept what they regard as 'unnecessary duplication of work'. Without a clear consensus between senior and junior management, the implementation of ISOs may lead to unnecessarily high transaction costs due to the duplication of paperwork and even lead to discontent among the managerial staff during the transitional period. This is well illustrated by the experience of a Taiwanese-financed electronic components manufacturer, when a large proportion of the administrative staff prepared the documents under the previous system during the first four months of the implementation of ISO 9000. Subsequently, in 1998, the firm failed its first internal audit and the General Manager ordered everyone to work overtime for a week to redo the missing documents (Field survey, March 2003). Obviously, the firm's productivity and, thus, its competitiveness decreased during the transitional period of ISOs implementation.

From the perspective of production, the implementation of ISOs may lead to a transformation for the workforce of procedures of production, especially if such procedures are incompatible with the 'best practices' identified by management consultants.

First, experienced engineers who learned the skills of their trade under the apprenticeship system may find it difficult in practice to adjust to the recommended production and documentation procedures after using their own procedures for years. For instance, an experienced technician with a Taiwanese-financed printing firm in Guangzhou always mixes colour agents to achieve the required results, largely based on his experience of the quantity and types of colour agents used. As he has not documented the exact formula of colour agents (and types of printing papers) used in previous printing runs, other technicians are unable to replicate his results. Nonetheless, this experienced technician resented being told by external consultants what he has to do under the new QMS, i.e., he felt that his skills and experience were not respected. Convinced that his method of working, refined by years of learning, was more efficient than the new system recommended by the external consultant who had only visited the work floor several times, he naturally refused to co-operate and adopt it (Field survey, March 2003).[3] Managers obviously have to be aware of the potential impact of the implementation of ISOs on experienced engineers, as their reluctance to co-operate in adopting a new QMS may lead to unexpected disruptions in production and thus have far-reaching consequences for the firm's competitiveness (the reputation of firm may suffer if shipments are delayed or if quality control is erratic).

Second, there are significant differences between the quantity-oriented working tradition commonly observed among Chinese workers and the quality-oriented system emphasised by ISO 9000. The paramount concern of many Chinese workers, especially semi-skilled workers, is about total volume rather than about the quality of the output, as it is the former that determines whether they receive a monthly or yearly bonus (Field survey, April 2003). The ISOs documentation procedures could easily be interpreted by these

workers as a 'cost-cutting trick' played on them by senior management, i.e., to ask them to do extra paperwork so that they will not qualify for the bonus. Although senior management can impose the new system by force, the workers can protest the adoption of the new system by doing only superficial paperwork (Field survey, March-June 2003). This is clearly demonstrated by the experience of a Taiwanese-financed paper printing firm in Guangzhou. The workers only performed part of the required documentation by recording the nature of the problems encountered during production, but without actually logging on the time and date of the incidents. Subsequently, the quality control staff were still unable to trace the faulty patch(es) of the production and the firm failed the internal audit (Field survey, March 2003). With their superficial paperwork, the workforce did little more than pay lip service to the senior management, and firm will obviously not reap the potential cost benefits of QMS / EMS. The above arguments on institutional inertia are consistent with the findings of Calingo *et al*. (1995) and Quazi and Padibjo (1998), who highlighted the resistance of employees to change, and of Hind (1996), who argued that it is vital for employees to have a positive attitude towards change if ISO 9000 is to be successfully implemented.

Institutional inertia and the resultant conflicts between senior management and the workforce may be especially pronounced when there is inadequate consultation with junior staff and when there are 'free-riders' (staff who deliberately do not conform to the new system but who are not disciplined). Resentment and conflict in the workforce obviously affect morale and harmony among the employees. When they encounter such resistance and the unexpectedly high initial costs of ISO implementation (which are an easy target for cost cutting), senior management may prematurely abort the implementation of ISOs unless they are resolutely determined to achieve the required standards. Furthermore, how senior management communicates the importance and purposes of documentation with other staff – whether they give the impression that they are fully committed to the implementation or are just 'window dressing' to address the requirements of customers – is vital for

[3] Although innovative ability and work standardisation are often thought to be mutually exclusive, Kondo (2000) have argued that they are theoretically complementary to each other.

successful implementation (Field survey, August 2001, March-April 2003). This finding is consistent with the statistically significant and positive relationship between the motives of managers in adopting ISO 9000 and business performance, discovered by Terziovski, Power and Sohal (2003:594) in their cross-sectional study conducted in Australia.

The above discussions lend support to the hypothesis on ISOs' implementation. Manufacturing firms in China find the implementation of ISOs costly, largely due to the high transaction costs related to documentation and to institutional inertia. This is especially the case for firms in the transitional period of ISOs implementation. With the high transaction costs and the resultant impact on a firm's competitiveness, a less-than-determined manager is likely to prematurely abort the ISOs implementation. This can explain why the majority of firms (1,278 out of 1,406) in China who withdrew from the ISO 9000 did so for reasons other than having failed the re-certification audit (ISO, 2003b:4). This finding is compatible with the experience of some SMEs in South Wales in the UK, who encountered real difficulties in implementing ISO 9000 (Thomas & Webb, 2003).

6 Evaluation of ISOs: Are you compliant?

This section tests the hypothesis on the evaluation of ISOs and analyses the intricacy of ISOs evaluation and firm competitiveness from two perspectives: the audit and the 'origin' of the certificate.

6.1 Audit: Playing the 'Audit Game'!

The audit is an important step in the process of certification and a vital follow-up procedure to ensure that certified firms continue to be ISOs-compliant. When auditors find lapses in the implementation of the system, this means that the documented system meets the standard's requirements but is not being followed. Such lapses are normally classified as either minor or major non-conformance, depending on whether they are simply an isolated occurrence or systemic in nature.

Conceptually, given the systematic audit mechanism of the ISOs, there should be no doubt about whether certified firms are complying: the internal audit is biannual, while the external audit is conducted once every three years as a condition for renewal of certification status. Practically, certified firms can 'play the audit game' by exploring either the specificities (i.e., tailoring for the audit) or loopholes (i.e., fooling the audit system) of the system.

6.1.1 Tailoring for the external audit

In the ideal scenario, professional auditors accredited by their regulatory authorities are well-trained to conduct the audit. Due to a lack of qualified auditors and a mismatch between the expertise of assessors and the requirements of the audit, however, certified firms can actually 'tailor for the external audits'.

The proliferation of ISOs has created a shortage of fully qualified professional assessors with practical experience in the industry and in certification in China. According to one Hong Kong-based independent auditor whose comments were confirmed by several experienced manufacturers, auditing firms sometime have to conduct inspections using auditors with expertise in other (related) sectors, e.g., an auditor in garments will conduct an inspection of a textile firm. These auditors normally conduct superficial inspections of the system documents (focusing on administration) but do not check on whether the manufacturing processes conform to the QMS (Field survey, April 2003). Partly as a result of the commercialisation of auditing, some audit firms are 'spin-offs' of management consultancy firms and tend to use standardised processes in the audit, e.g., professional auditing firms, such as AQSR, have generic checklists that auditors customise for individual firms. Different technical knowledge of manufacturing processes is required for each industrial sector, and each specific manufacturing process requires very specific technical know-how. Such knowledge may partly depend on the size (large firms may use different manufacturing techniques and machinery to exploit economies of scale) and nature (a sub-contractor may use different manufacturing processes than an integrated manufacturer) of a firm. Without the required sector-specific knowledge in each of the

industrial sectors, auditors may not be able to ask the appropriate questions to facilitate the audit. Even where auditors have specific knowledge of the sector, they may not all have technical knowledge of the state-of-the-art machinery and manufacturing processes used by the TNCs. This is why, in reality, some auditors have to trust what they are told by the certified firms. 'As long as we know how to do the paperwork [to play the audit game], we can get past the external audit without fully implementing the ISOs,' claimed the Deputy General Manager of a Taiwanese-financed electronics firm in Guangzhou (Field survey, March 2003). Similar claims were made by a number of General Managers of other firms interviewed in Guangzhou and Hangzhou (Field survey, August 2001, March-June 2003). The most extreme claim was made by the General Manager of a Taiwanese-financed paper printing firm: 'There are only a limited number of successful examples of ISOs in China.... [N]ine out of ten certified firms have been unable to fully implement ISOs standards. Those who know how to play the game can get past the external audit without fully implementing the ISOs standards! After all, the external auditors do not always know the industry that they are auditing.... At the moment, our firm is achieving only about 70% of the ISO 9002 requirements' (Field survey, March 2003). It is likely that this claim is somewhat exaggerated but it does reflect part of the realities of evaluating ISOs in China. Under these circumstances, the manufacturing processes of a firm are not actually evaluated, and the principles of QMS and their potential benefits for quality control (and, thus, for a product's competitiveness) are naturally not realised.

As mentioned earlier, ISOs are generic management systems rather than product standards with specific qualitative and environmental benchmarks. This leaves a lot of room for managers to manoeuvre when preparing for the external audit. Due to the nature of the audit procedures, certified firms play a vital role in the audit: they have to provide details of their manufacturing processes and systematic documentation to the external assessors. As the managers and engineers in a certified firm are the people who have intimate knowledge of the firm's manufacturing processes, it is possible for them to either under-report or even withhold some vital

information. Moreover, some experienced managers who know how 'to play the audit game' can actually prepare a whole package of 'problems and solutions' for the external audits, e.g., outlining issues the firm has not yet resolved and the corrective actions that the firm will take to rectify the situation. Faced with such a professionally prepared internal audit report, most independent auditors will take the 'easy option' by largely agreeing to what the internal audit reports suggest rather than going all the way to 'pick out any unreported issues' (Field survey, April 2003). In fact, some internal auditors deliberately leave some minor unresolved issues (that do not have any tangible impact on productivity but are costly to implement) for the next round of the external audit, and so fulfil the ISOs' spirit of continual improvement (*Ibid*.). By doing so, the firm not only keeps its certified status, but also lower the transaction costs of implementing ISOs. It can be argued that, in such circumstances, the external auditors are simply there to take part in 'making a show' of fulfilling the requirements of ISOs. The above strong claim that auditors are unfamiliar with the client's industry and manufacturing processes is also supported by Hutchins' (1993) findings in developed countries. Partly due to the dynamic business climate encountered by the certified firms, Fiorentino and Perigord (1994:61) have gone further to suggest that auditors are having on-the-job training, while Aarts and Vos (2001) also revealed that the choice of certifying authority influences the subsequent performance of firms.

6.1.2 Fooling the audit system?

Ideally, external consultants identify the 'best practice' for the firm to follow under the guidance of QMS / EMS in order to fulfil the ISOs' requirements, before such practices are carefully documented. Consultants, along with senior managers and engineers, then develop a series of recommended actions to achieve the goals of 'best practice' and 'continual improvement' of the firm's QMS / EMS.[4]

[4] Partly as a response to the high administrative costs of the documenting procedures under the ISO 9001/2:1994, the ISO 9001:2000 places greater importance on the involvement of top management, continual improvement and quality management.

Nonetheless, the cost-effective procedures that are actually adopted are sometimes different from the theoretical 'best practices', i.e., a firm's managers and engineers identify and adopt 'second-best practices'. This is partly because 'best practices' as developed under the guidance of QMS / EMS are not cost-effective in China, and partly because some external consultants play only a limited role in the process.

The use of 'second-best practices' is illustrated by the experience of a well-known TNC's subsidiary in Hangzhou. Before recruiting external consultants to prepare for ISOs certification, the senior managers and engineers of this Japanese-financed electrical appliances motor-manufacturing firm had already designed a number of possible work-floor layouts, the flow of the products and the corresponding manufacturing processes, etc. They then conducted a trial operation to gather all vital information and opinions from the engineers and line-managers on the factory floor. The senior managers, engineers and internal in-house assessors then identified the 'second-best practices' for the firm and documented them: the procedures that were both cost-effective and that fulfilled the requirements of the ISOs. They then recruited an external consultancy firm to help them implement the 'second-best practices', before, in 1998, securing ISO 9002 and ISO 14001:1996 certification through the China-based certification bodies. Interestingly, the General Manager told the authors explicitly that the '*ISOs are for reference only*. It is the ideal system, but we have to adjust the ISOs documented procedures in our plant according to the reality of the manufacturing sectors in China from time to time to maintain the competitiveness of our products' (italics added) (Field survey, April 2003). It must be emphasised that this is not the only case of the use of 'second-best practices' among established and well-funded firms in China. Another Hong Kong-financed mobile telecommunications equipment manufacturing firm in Guangzhou also documented their own ISOs guidelines before recruiting consultants from New Zealand to assist in its implementation. 'The ISOs guidelines must be flexible and compatible with the commercial realities encountered by the firm', claimed the firm's Deputy General Manager (Field survey, March 2003).

As previously emphasised, the ISO publishes the standard guidelines but it does not conduct the assessment *per se*. Both the audit and certification of ISOs are conducted independently of the ISO by third-party certification bodies worldwide, and the competency of those certification agencies is regulated by their corresponding (national) accreditation bodies (ISO, 2003a, 2003c:5-9). In other words, it is possible for a firm to pass an ISOs audit with flying colours when the audit is conducted by one certification agency but to fail miserably when the audit is conducted by another. This is especially the case in China where the regulation of certification agencies is an issue, despite the establishment of the China National Accreditation Board for Certifiers (CNAB). It is not implausible that a minority of the 92 accredited agencies in China have adopted a 'profit-oriented business-friendly' audit approach to retain customers (*China Daily*, 12 September 2002). In addition to the shortage of qualified auditors discussed earlier, this helps to explain the claim of a number of the managers that were interviewed that they were used to 'playing the audit game'. In light of the above phenomena, it is easier to understand why some major foreign buyers not only request ISO 9001 and/or ISO 14001 certification from their suppliers, but also demand that the ISOs be certified and audited by reputable (overseas) auditors (e.g., the UK-based BSI (UKAS), the US-based AQSR (ANSI-RAB), the Germany-based TÜV CERT Certification Body) rather than by some of the newly established auditors based in China (Field survey, June 2003). Obviously, the less-than-rigorous audits performed by some Chinese certification agencies and the exploration of loopholes in the external audits by some certified firms has driven up the cost of ISOs adoption in China and lowered the competitiveness of the firms audited by the China-based certification agencies.

The above discussions provide a *prima facie* case in support of the hypothesis on the evaluation of ISOs. Partly due to the shortage of qualified auditors in China and partly due to the high costs of full compliance with the QMS / EMS, some manufacturing firms in China have been able to fulfil the audit procedures without fully complying with the ISOs' principle of 'continual improvement'. It must be emphasised that the above findings are based on a number of selected case studies and that there is no implicit

suggestion that all certified firms in China are exploring loopholes in the audit procedures of ISOs.

6.2 Delaying Tactics: 'Origin' of the Certificate

Some firms that have yet to be ISOs-certified may employ 'delaying tactics' to try to retain their customers for the time being.

One commonly used strategy is to provide customers with relevant information about the firm's preparation for certification. For instance, the manager may claim that s/he has already appointed a management consultant company to help the firm prepare for certification. It is expected that the firm 'will be certified soon'. However, the senior management of the firm may or may not have a pre-defined timeline for the certification (Field survey, March-June 2003). This phenomenon can be explained by the fact that not every manager in the firm is convinced of the real benefits of ISOs certification, but are 'forced' to implement the standards by the market (as discussed earlier). Some managers are also discouraged by the high transaction costs involved in implementing ISOs, especially with regard to the disruption of production and the resistance to change among experienced engineers that we discussed earlier. If the senior management is not fully committed to the implementation of ISOs, the whole certification plan may be delayed repeatedly, and even postponed indefinitely. In the long run, such delaying tactics will not help a firm maintain its competitiveness. This is especially the case for those sectors where ISOs certification has been adopted as the *de facto* industrial norm.

Some managers provide potentially misleading information about their firm's certification, printing the logos of ISO accredited certification bodies on their name cards and product pamphlets, even before actual certification has taken place. In some cases, the processes for certification may be due to take place soon and the firms are confident of passing the audit. In other cases, the firms have failed the first round of the audit and they are preparing for a re-audit. In a Taiwanese-financed pneumatic equipment manufacturing firm in Guangzhou, the BSI-NACB logo is printed on the General Manager's and Deputy General Manager's name cards. Interestingly, the relevant ISO

wordings, such as ISO 9000, ISO 14000 and the corresponding certificate numbers, are not printed on the name cards. When pressed for an explanation, the General Manager told the authors privately that their headquarters in Taiwan had been certified by the BSI-NACB as compliant with ISO 9001, but that the manufacturing plant in China had not! As their major customers have not yet demanded that they be ISO certified (80% of their products are directly sent to other foreign-financed firms in China), certification is naturally not the first priority of the General Manager. The General Manager claimed that 'the good quality and reputation of our products are better than the ISOs in the Chinese market' (Field survey, March 2003).

Keen market competition is one of the major reasons why some managers knowingly violate rules on the use of the logos of the accredited certification bodies, despite explicit requests from the ISO that the scope of activities and geographical locations covered by the certification must be accurate and precise (ISO, 2003d:3-9). Without certification, they may lose out to competitors in China who have already been certified. After all, the differences in production costs between Chinese producers of a similar size are minor, so even small cost advantages (including saving on the cost of ISOs compliance) are eagerly sought by producers. Obviously, this argument is 'sector-specific', i.e., ISOs are a necessary condition for competitiveness in certain industrial sectors, but this provides additional evidence to support the market-driven hypothesis on preparation for ISOs that was discussed earlier.

7 Conclusions and Implications

Based on the proposed 'PIE' analytical framework (Figure 1) and the empirical evidence presented in this paper, it is argued that international standards (ISO 9000 and ISO 14000 (ISOs)) have a different (both positive and negative) impact on the competitiveness of firms in southern and south-eastern China. It is also shown that the impact on competitiveness at different stages of the adoption of an ISO standard differs. While we acknowledge the firm-specific limitations of our study, the empirical evidence presented in this

paper provides a *prima facie* case to support the three research hypotheses on the preparation, implementation and evaluation of ISOs.

During the stage of preparation ('P'), the senior management has to decide whether, and within what timeframe, to adopt the ISOs. We found that it was quite often the case that export-oriented manufacturers had no viable alternative but to adopt recognised international standards as soon as possible in order to enhance their competitiveness in overseas markets. This verifies the first hypothesis: *manufacturing firms in China adopt the ISOs to fulfil market requirements and maintain their international competitiveness*.

Once the firms have decided to adopt the ISOs, it is argued that a majority of them experienced a reduction in competitiveness in the short term but an enhancement in the long term. The negative impact in the short term is mainly due to the diversion of scarce resources to the implementation ('I') of ISOs, in areas such as the preparation of documentation and the provision of training to the workforce. Worse still, some senior managers underestimate the difficulties of overcoming institutional inertia. The evidence supports the second hypothesis: *manufacturing firms in China find the implementation of ISOs costly, at least during the transitional period*. Nonetheless, it has to be emphasised that the reduction in competitiveness experienced by some manufacturers during the transitional period is largely due to a lack of preparation before implementation, rather than to the deficiencies of the ISOs *per se*.

Audits are a vital part of the evaluation ('E') process and an effective way of achieving the ISOs' goal of 'continual improvement'. However, our study suggests that audits are conducted too frequently and that preparing the documentation for each external audit involves a very high transaction cost. This is why some firms are either 'playing the audit game' by providing what the external auditors are looking for or taking the 'second-best' documentation approach: reaching a consensus between the senior managers and the workforce on how production and administrative tasks should be documented before the external consultants are invited to prepare the documentation. This finding supports the third hypothesis: *manufacturing firms in China are*

finding ways to fulfil the audit procedures without fully complying with the ISOs' 'continual improvement' principle. Furthermore, this paper suggests that previous studies on the constraints of ISOs are incomplete in that they have been unable to reconcile the intricate roles of external auditors and managers in the process of evaluation and the long-term implications of this for a firm's (industrial) competitiveness (see below).

The 'counter-measures' on external audits adopted by some firms in China can be interpreted from two perspectives. For advocates of ISOs and intellectual property rights, this is a deception, or even a blatant violation of international standards. Obviously, the 'profit-oriented' attitude adopted by a minority of China-based certification agencies enhances the negative perception of China-based certification agencies held by prospective foreign buyers. This explains why some major foreign buyers not only request ISO 9001 or ISO 14001 certification, but also demand that the certification and audit be carried out by reputable (overseas) certification agencies, e.g., BSI. This drives up the costs of ISOs certification and may push Chinese audit firms out of the market. Furthermore, this may have further ramifications for the international reputation of China as a rule-abiding country – as it implies that foreign arbitrators (for example, the Dispute Panel of the WTO on trade disputes and anti-dumping) do not trust the information provided by Chinese audit firms. To revive the reputation of the Chinese auditing industry, the China National Accreditation Board for Certifiers (CNAB) must adopt a pro-active approach in policing unscrupulous and short-sighted 'profit-oriented' certification agencies by sending out an unambiguous signal that incompetent agencies will be taken off the accreditation lists.

Taking up the concerns of conspiracy theorists, the aim of these 'counter-measures' is to knock down the non-tariff trade barriers imposed unilaterally upon developing countries by developed countries. Sanctioned by the WTO's Agreement on Technical Barriers to Trade (TBT) as a means of standardising the use of the TBT's potential instruments, the ISOs can actually be used by developed countries as effective non-tariff barriers to keep out exports from developing countries (Mohamed, 2001:582). This is especially

the case for SMEs in China, where the high costs of ISOs implementation and the limited tangible economic benefits (during the first year or two of the implementation) offset the cost advantages of being nimble competitors. Noting the hypocrisy of the imposition of non-tariff trade barriers, one researcher has stated: "[T]he WTO agreement that puts restrictions on the ability of the developing countries to pursue activist ITT [industrial, trade and technology] policies is only a modern, multilateral version of the 'unequal treaties' that Britain and other NDCs [now-developed countries] used to impose on semi-independent countries" (Chang, 2002:127-128). Furthermore, the hypocrisy of insisting that suppliers from developing countries implement international standards is well illustrated by the fact that even some SMEs in the UK find real difficulties in implementing ISO 9000 (Thomas & Webb, 2003), and that a number of firms in the US are reluctant to comply with ISO 14000 due to the public scrutiny of their environmental performance that this would entail (Delmas, 2002).

7.1 Implications for Theory and Further Research

Theoretically, this paper contributes to the literature by proposing the 'PIE' analytical approach (Figure 1), which provides scholars with a systematic framework to conduct a comprehensive examination of the dynamic impact of the adoption of the ISOs on the competitiveness of firms. This is different from existing studies, which mainly provide a partial analysis by focusing on some aspects of the adoption of ISOs. The strength of the proposed 'PIE' analytical framework is illustrated by its ability to disentangle and analyse the effect of ISOs adoption on the competitiveness of firms at different stages. This helps researchers not only to identify the overall impact of ISOs adoption on a firm's competitiveness, but also to examine its specific impact at each stage of adoption; i.e., different industrial sectors may encounter different types of difficulties during the period when ISOs are being implemented.

To test the general applicability of the 'PIE' analytical framework, it is suggested that future research can focus on the impact of implementing ISOs on the competitiveness of non-manufacturing (including service) sectors in

developing (including China) and developed countries. In addition, comparative studies can be conduced to investigate whether the impact of implementing ISOs in different regions and/or different industrial sectors differs significantly; i.e., to what extent are ISOs generic systems of management?

7.2 Implications for Managers

Based on the 'PIE' framework, it is suggested that managers in manufacturing firms in China (or other developing countries) pay attention to a number of important issues related to the adoption of ISOs, which are summarised in Table 4.

[INSERT TABLE 4 ABOUT HERE]

Managers who consider adopting ISOs must identify the rationale for adoption and prepare for expected and unexpected disruptions in production and administration before the system is integrated into the firm's QMS / EMS. To lower the transaction costs (and overcome the institutional inertia) of ISO implementation, it is essential for the management to get the workforce involved during the early stage of preparing to implement the ISOs, so that a consensus on their adoption can be reached. A clearly defined mechanism for rewarding conformers and punishing non-conformers may be implemented if supported by the majority of the workers. Given the high transaction costs involved, it is advisable for managers to budget for contingency plans relating to the implementation of the QMS / EMS, especially during the first year or two of the transitional period (otherwise, the implementation may become the target of cost-cutting). Once a firm's managers decide to adopt the ISOs, they are also advised to try their best to implement them wholeheartedly and seek to fulfil the principle of 'continual improvement', rather than deliberating trying to explore the specificities and loopholes in the external audit procedures. Only by doing so can a firm reap the benefits of ISOs that are fully integrated into the system. Cutting corners by adopting 'counter-measures' on external audits can lower the transaction costs involved in adopting ISOs and maintain the cost competitiveness of the firm in the short term only. Apart from other negative implications for the reputation of those

Chinese certification agencies that are associated with the 'counter-measures' discussed above, it is possible that the half-hearted 'compromise' mentality of the management on the adoption of ISOs may be interpreted by the workforce as the firm's policy. Should this be the case, it is plausible that the management will encounter difficulties in further improving productivity and in moving up the value-added ladder of the commodity chain, where systematic management, a disciplined workforce and diligent quality control are essential.

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Table 1: A Matrix of Regional and International Standards

	Regional / National	International
Generic	• BS (British Standard) • DIN (German Institute for Standardization) • EN (European Standard – used throughout Europe) • JIS (Japanese Standard Association)	• ISOs: ISO 9000 & ISO 14000 • ILO's labour standards • SA 8000
Sector-specific	• Clean Clothes Campaign (CCC) on working conditions • US Fair Labor Association (FLA) on working conditions in garment factories • European Retailers Representative Group's Good Agricultural Practices (EUREP-GAP) for integrated crop and pest management in farm production	• SAE (Society of Automotive Engineers) • IEEE (Institute of Electrical and Electronics Engineers) • WRAP (Worldwide Responsible Apparel Production) for garments • Oeko-Tex Standard 100 ("green" standard for textiles & clothing) • UN's Hazard Analysis and Critical Control Point (HACCP) for food safety management

Note: With the exception of some clearly defined standards, such as the ISOs and those of the ILO, the geographical classification of the above table can be arbitrary. For instance, WRAP was initiated by the US garment industry as a response to the even more stringent social and labour standards promoted by NGOs, but is endorsed by many garment associations and manufacturers with links to the US market. Hence, it is classified as one of the international standards.

Source: Compiled by the authors.

Table 2: The Number of Organisations in Different Regions Certified for the ISO 9000, 1995 – 2001

	1995	1996	1997	1998	1999	2000	2001	ISO 9001:2000
			(year-end figures, in numbers)					
Africa/West	3,378	6,162	8,668	12,150	17,307	20,185	19,751	1,058
Asia	(2.65)	(3.79)	(3.88)	(4.47)	(5.04)	(4.94)	(3.87)	(2.39)
Central & S.	1,220	1,713	2,989	5,221	8,972	10,805	14,423	580
America	(0.96)	(1.05)	(1.34)	(1.92)	(2.61)	(2.64)	(2.82)	(1.31)
North	10,374	16,980	25,144	33,550	45,166	48,296	50,894	1,887
America	(8.15)	(10.44)	(11.26)	(12.34)	(13.14)	(11.82)	(9.97)	(4.26)
Europe	92,611	109,961	143,674	166,255	190,248	220,127	269,950	22,888
	(72.72)	(67.58)	(64.34)	(61.16)	(55.36)	(53.87)	(52.87)	(51.62)
UK	52,595	53,099	56,696	58,963	63,700	63,725	66,760	8,501
	(41.30)	(32.64)	(25.39)	(21.69)	(18.54)	(15.60)	(13.07)	(19.17)
Far East	9,240	18,407	29,878	37,920	56,648	81,919	126,779	14,434
	(7.26)	(11.31)	(13.38)	(13.95)	(16.48)	(20.05)	(24.83)	(32.55)
China	507	3,406	5,698	8,245	15,109	25,657	57,783	7,413
	(0.40)	(2.09)	(2.55)	(3.03)	(4.40)	(6.28)	(11.32)	(16.72)
Hong Kong + Macau SARs	739	1,312	1,637	1,949	2,168	2,600	3,853	553
	(0.58)	(0.81)	(0.73)	(0.72)	(0.63)	(0.64)	(0.75)	(1.25)
Australia &	10,526	9,478	12,946	16,751	25,302	27,299	28,819	3,541
New Zealand	(8.27)	(5.83)	(5.80)	(6.16)	(7.36)	(6.68)	(5.64)	(7.99)
WORLD	127,349	162,701	223,299	271,847	343,643	408,613	510,616	44,338

Notes:

- The figures in brackets represent the percentage share of the world's total.
- The above numbers are not absolute, as ISO does not issue certificates of conformity to ISO 9000 *per se* (the numbers are based on surveys conducted by the ISO). According to the China National Regulatory Commission for Certification and Accreditation, 92 agencies are authorised to issue ISO accreditation, 90 of which are allowed to conduct accreditation training work in China. About 80,000 enterprises in China have obtained the ISO 9000 (*China Daily*, 12 September 2002).

Source: Compiled from ISO, 2003c.

Table 3: The Number of Organisations in Different Regions Certified for the ISO 14001, 1995 – 2001

	1995	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
	(year-end figures, in numbers)						
Africa/West Asia	1 (0.39)	10 (0.67)	73 (1.65)	138 (1.75)	337 (2.39)	651 (2.84)	923 (2.51)
Central & S. America	3 (1.17)	15 (1.01)	98 (2.21)	144 (1.83)	309 (2.19)	556 (2.43)	681 (1.85)
North America	1 (0.39)	43 (2.88)	117 (2.64)	434 (5.50)	975 (6.91)	1,676 (7.32)	2,700 (7.34)
Europe	226 (87.94)	948 (63.58)	2,626 (59.24)	4,254 (53.94)	7,365 (52.21)	11,021 (48.13)	18,243 (49.62)
UK	61 (23.74)	322 (21.60)	644 (14.53)	921 (11.68)	1,492 (10.58)	2,534 (11.07)	2,722 (7.40)
Far East	25 (9.73)	419 (28.10)	1,356 (30.59)	2,532 (32.10)	4,350 (30.84)	7,881 (34.42)	12,796 (34.80)
China	- (0.00)	9 (0.60)	22 (0.50)	94 (1.19)	222 (1.57)	510 (2.23)	1,085 (2.95)
Hong Kong + Macau SARs	- (0.00)	7 (0.47)	46 (1.04)	56 (0.71)	52 (0.37)	106 (0.46)	166 (0.45)
Australia & New Zealand	1 (0.39)	56 (3.76)	163 (3.68)	385 (4.88)	770 (5.46)	1,112 (4.86)	1,422 (3.87)
WORLD	257	1,491	4,433	7,887	14,106	22,897	36,765

Notes:

- The figures in brackets represent percentage share of the world's total.
- The above numbers are not absolute, as ISO does not issue certificates of conformity to ISO 14000 *per se*; they are based on surveys conducted by ISO.

Source: Compiled from ISO, 2003c.

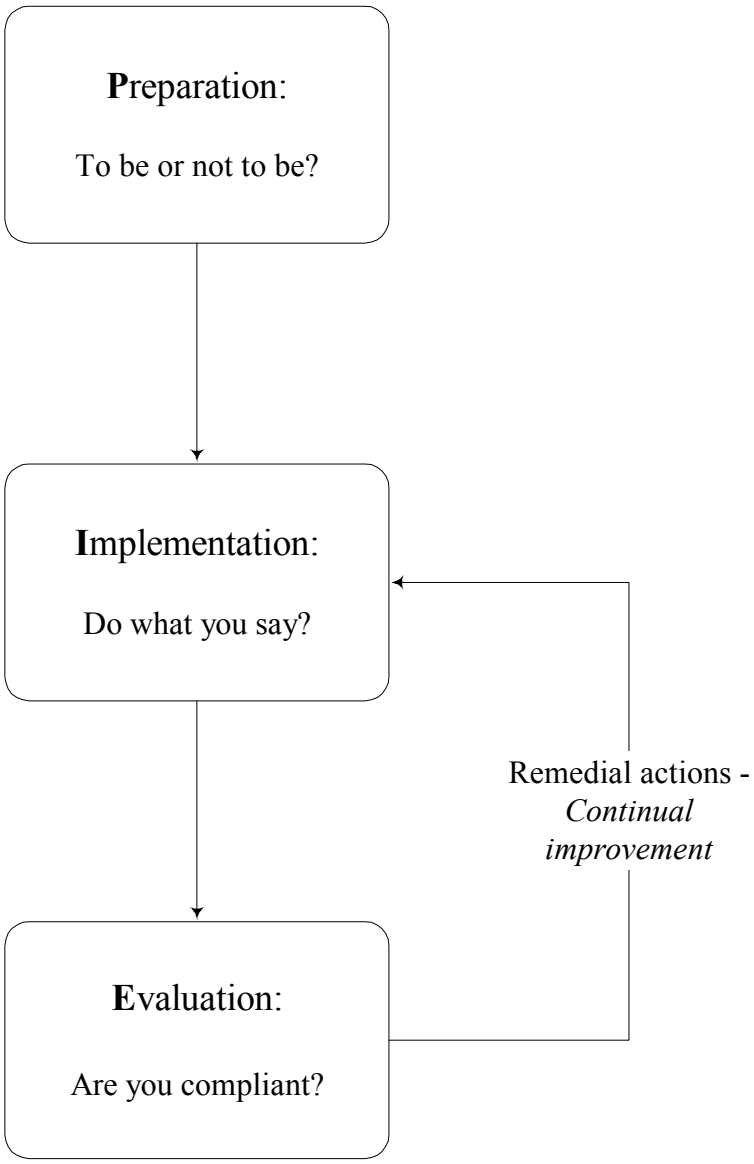
Table 4: Issues to Consider in Adopting ISOs

'PIE' procedures	**Issues to consider**
***P*reparation**: To be or not to be?	• What are the reasons for adopting ISOs? ▪ To improve cost efficiency: by how much? Will the estimate be overly optimistic? Have major competitors done so and what have the effects been? ▪ Market-driven: no choice but to do what the customers want! ▪ Producer-driven: do not follow the herd (do we need it?) • Are there any agendas behind the adoption of ISOs, e.g., part of a corporation-wide marketing strategy? • Will the costs (of implementation and evaluation) be an issue for the company's finances? Will they be an easy target for cost cutting?
***I*mplementation**: Do what you say?	• Has the firm provided adequate training for managers & workers? • Has the documentation been written for the use of employees, managers or consultants? ▪ Over-simplified documents: those that are too user-friendly may cause employees to be under-prepared for the implementation of ISOs ▪ Over-complicated documents: those that are too meticulous may cause employees to become over-prepared for the implementation of ISOs (and drive up costs and delay the progress of implementation) ▪ Division of labour: has it been divided by department or function into easily useable manuals? Has the division clarified the roles and responsibilities of different staff? • Does a consensus on the adoption of ISOs exist between senior management and the workforce? ▪ Inertia of administrative staff: how determined are the managers to see the implementation through? How to minimise the duplication of administrative tasks in the transitional period? ▪ Inertia of technical staff: how can experienced technicians be convinced to adopt the new system, which may demand a transformation of production procedures? ▪ Inertia of workers: how can the quantity-oriented working tradition of (Chinese) workers be overcome? ▪ Free-riders: how can the non-confirmers be convinced / disciplined?
***E*valuation**: Are you compliant?	• Has the firm prepared for the audit? ▪ Internal audit: are the internal auditors well-trained and supported by the management? ▪ External audit: are the external auditors qualified (to audit the specific industry)? Has the external audit been conducted properly with the full support from the managers and internal auditors (rather than exploring the loopholes in the auditing procedures)? Have the recommended remedial actions toward the 'best practices' been enforced?

    - ‘Second-best practices’: can the differences between the ‘best practices’ and the ‘second-best practices’ be reconciled?
- Have the results justified the costs of ISO implementation?

Source: Authors.

Figure 1: The 'PIE' Analytical Framework



Source: Authors.